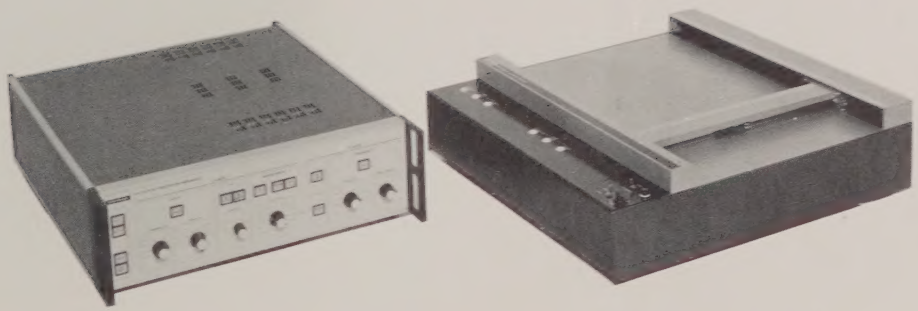
PLOTTER INTERFACE
1180
and
XY RECORDER
8700

SOLARTRON
Schlumberger

OPERATING MANUAL

PLOTTER INTERFACE 1180 and XY RECORDER 8700



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OPERATING MANUAL

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CONTENTS

This manual provides the information necessary for the operation of the instrument. If servicing instructions are required a Service manual may be purchased on application to Schlumberger.

Section 1	Principles of Operation
Section 2	The Controls, Front Panel and Rear Panel.
Section 3	Installation, Options and Accessories
Section 4	Using the Controls
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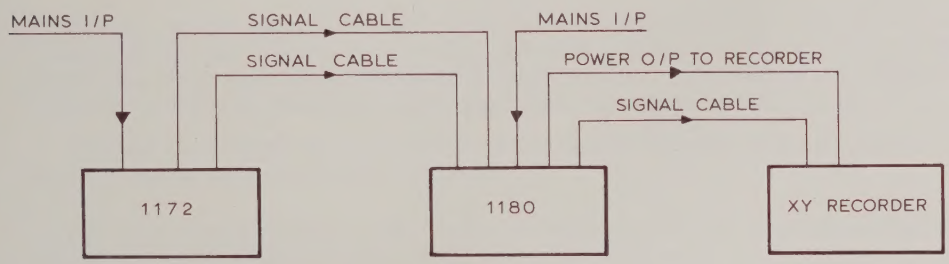
Section 6	Technical Specification
Section 7	Extension Units

SECTION 1 Principles of Operation

The 1180 Plotter Interface unit has been designed specifically to interface the 1172 Frequency Response analyser to the Schlumberger 8700 XY Recorder. It accepts measured digital data from the 1172, processes the data, and then generates the appropriate analogue voltage for driving an XY Recorder. Simplicity and flexibility of operation are major features; the system is connected as shown below.



When two parameters are to be plotted (say log R and θ against log f) the system plots first one and then the other, a point at a time. Joining the points thereby produces a pair of graphs from a single channel XY Recorder.

Although the Plotter Interface can be used with most standard recorders the 8700 XY Recorder has been specifically designed to operate with the 1180.

In this manual the instructions relate to a system comprising a 1172 Frequency Response Analyser, 1180 Plotter Interface and 8700 XY Recorder. Use of the 1180 Plotter Interface with other recorders is explained in Section 3.

The following plots may be selected with the system:

Bode (Log R and/or θ against Log f)

Co-Quad (a and/or jb against Log f)

Nichols Plot (Log R against θ)

Amplitude/Frequency (R and/or θ against Log f)

Nyquist (jb against a)

SECTION 2 The Controls, Front Panel and Rear Panel

The Front Panel Controls

Introduction

The front panel comprises a selection of rotary range switches and electronic touch keys, and a scaling potentiometer. The electronic touch keys have no moving parts and need only slight finger pressure to activate them; they are operated by simple Press for on/Press for off and activation is indicated by a lamp, incorporated in each switch, which lights when the switch is pressed.

Although the electronic touch keys are themselves silent in operation, optional circuitry is included to give an audible click as each key is activated.

The function of each control on the front panel is described in detail. Examples of their use are given at the end of this section (Refer also to "Using The Controls").

Switches to set the extreme parameters of the graphic plot except for Nyquist and Co-Quad plots, described in Section 4.

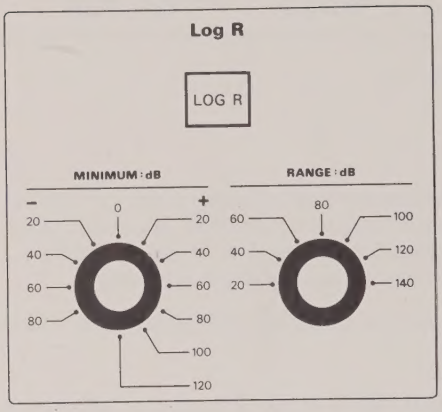
Selecting **SET 0** causes the pen on the XY recorder to move to the bottom left hand corner of the graph.

Selecting **SET FSD** causes the pen on the XY recorder to move to the top right hand corner of the graph.

Enables the outputs from the 1180 Plotter Interface to the XY recorder. The 1180 now moves the pen of the XY recorder to the appropriate position whenever a measurement is made with the 1172.

Enables a point (or points) to be plotted every time a measurement is made by the 1172.

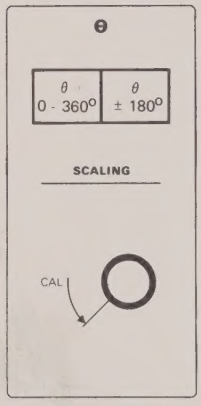
Y-AXIS CONTROLS



LOG R Selects the log R parameter on the Y - axis.

MINIMUM dB When **LOG R** selected is set equal to or below any required measurement.

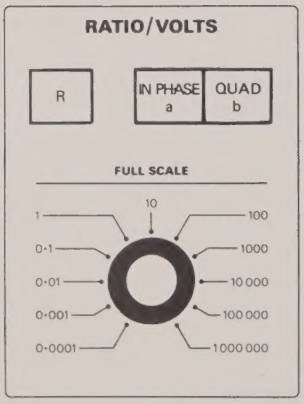
RANGE dB When **LOG R** selected is set such that the maximum required measurement does not exceed the sum of the "MINIMUM ' and "RANGE ' dB settings.



θ **0 – 360°** Selects a 0° to 360° scale on the Y - axis.

θ **± 180°** Selects a – 180° to + 180° scale on the Y - axis.

"SCALING" A scaling potentiometer to vary the Y - axis parameter gain when either θ, **0 – 360°** or θ + **180°** is selected and the X - axis parameter gain when θ **± 180°** (X - axis) is selected. The maximum possible attenuation is 2:1.



R

IN PHASE a

QUAD b

Switches to select the 1172 R, a, or jb measurement on the Y - axis of the XY plotter.

FULL SCALE Selects the required range when **R**, **IN PHASE a** or **QUAD b** is selected to accommodate the largest expected signal. If the 1172 is working in single point (**X** or **Y**) then the switch is calibrated in volts and suitable values are 0.01, 0.1, 1, 10, 100 and 1000. If the 1172 is working in point to point (**Y/X**) the switch is calibrated in ratios and should be set so that the greatest expected values do not exceed the switch setting.

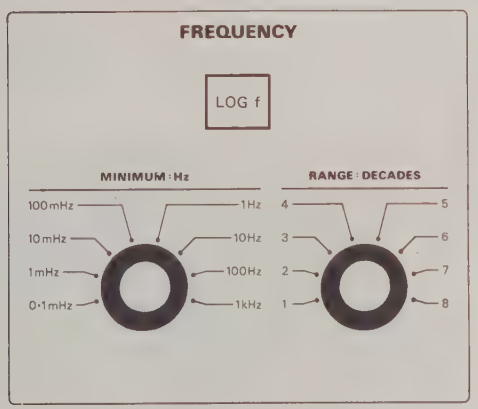
X - AXIS CONTROLS

θ
± 180°

Sets the X - axis parameter for a Nichols plot. When selected the **SCALING** potentiometer is used to select the X - axis parameter gain; the maximum possible attenuation is 2:1.

IN PHASE
a

Selects the 1172 **'a'** measurement on the X - axis for Nyquist plots.



LOG f Selects log *f* on the X - axis.

MINIMUM : Hz When log *f* selected is set equal to or below the lowest frequency required to be recorded.

RANGE : DECADES When log *f* selected is set to the number of decades the parameter covers, e.g. 1 mHz to 10Hz equals 4 decades.

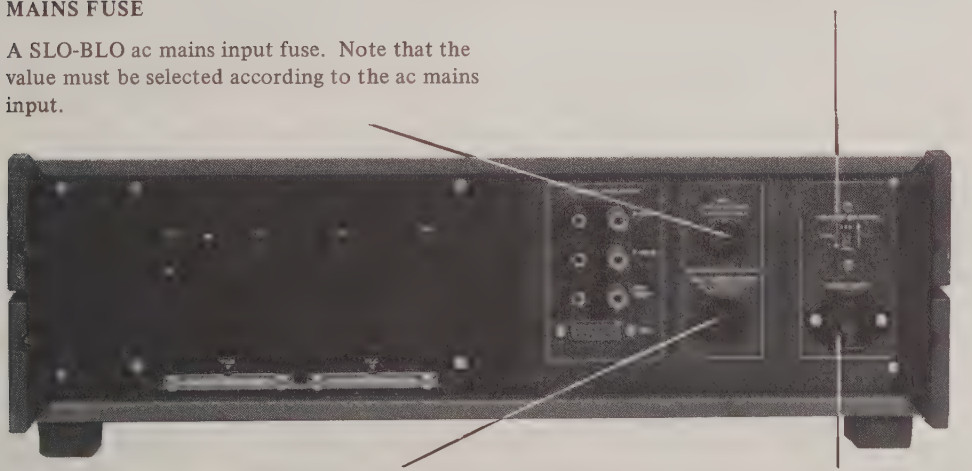
The Rear Panel

VOLTAGE SELECTION

A two position slide switch that must be set as appropriate before connecting the ac mains supply to the instrument.

MAINS FUSE

A SLO-BLO ac mains input fuse. Note that the value must be selected according to the ac mains input.



POWER OUTPUT

Three pin ac mains output plug for XY Recorder.

POWER INPUT

Three pin ac mains input plug.

SECTION 3 Installation, Options & Accessories

INSTALLATION

The 1180 Plotter Interface consists of two units, interconnected by two 34 - way flat cables. Unit 1 is a free standing case and unit 2 is a module which plugs into the rear of the 1172. Two cables connect the 1180 to the 8700 XY Recorder, a multicore cable carrying data, and the other carrying the mains power supply.

Assembling The System

1. Thread the 34 - way flat cables through the panel of the 1180 plug-in module and locate the sockets in their respective plugs (C to PLC and D to PLD) as shown in Fig. 3.1a. The plugs and sockets are marked with arrows which must be aligned to ensure correct orientation. Secure the cables with the clips provided as shown in Fig. 3.1b.

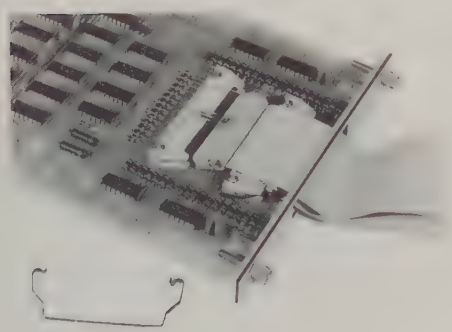


Fig. 3.1a

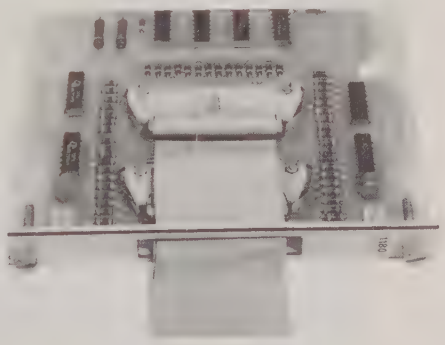


Fig. 3.1b

2. Remove the 1172 Rear Panel and identify slot 20 in the Frame Assembly. Remove the small blank panel from slot 20 and insert the 1180 unit into the 1172. The back of the 1172 should now look like Fig. 3.2. Tighten the captive screws at the top and bottom one turn at a time. Feed the flat cables through the aperture in the 1172 Rear Panel and fit the latter back on the 1172.

3. Connect the flat cables to the sockets on the 1180 rear panel as shown in Fig. 3.3. Again ensure arrows are aligned.

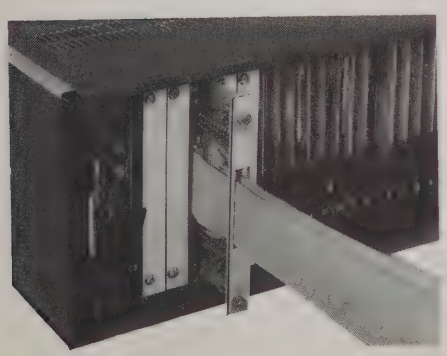


Fig. 3.2

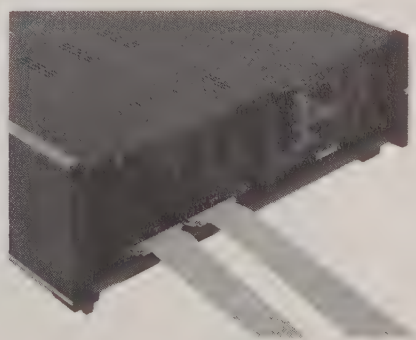


Fig. 3.3

Note: Plugs C and D have, on later models, been renamed F and G.

4. Check that the 1172 and 1180 voltage selectors are set to the correct voltage and that the correct fuses are fitted, refer Section 2 (The Rear Panel).

5. Connect the 1172 and 1180 mains supply leads to the power supply point.

   NOTE:- Mains supply cable connections.

Brown:-	Line
Blue:-	Neutral
Green/Yellow:-	Earth.

6. Check that the Mains Selector on the 8700 XY Recorder is set to the correct voltage and that the correct fuse is fitted in the base panel of the Recorder.

7. Check that the plotting table is clear of books or other extraneous matter.

8. Connect the power cable of the 8700 XY Recorder to Socket SKB on the 1180 Rear Panel.

9. Connect the 15 way cable between socket SKE on the 1180 and socket SKA on the 8700 Recorder as shown in Fig. 3.4a and lock the connectors.

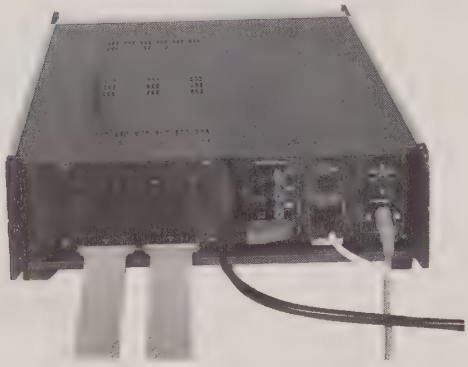


Fig. 3.4a

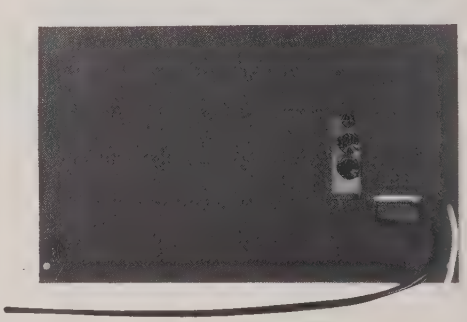


Fig. 3.4b

10. Press the Power button on the 1172 and check that its front panel is in the mains-on condition (see 1172 Operating Manual).

11. Check that the **Set Zero, R** and **Log f** buttons are lit on the 1180 Plotter as shown in Fig. 3.5.

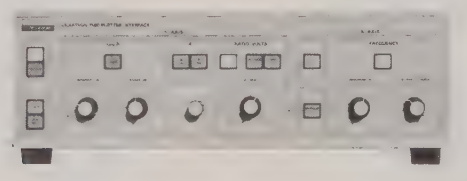


Fig. 3.5

12. Switch on the 8700 XY Recorder and check that the Power lamp is on.

CAUTION This instrument requires an unrestricted flow of air for efficient operation. Avoid blocking the ventillation slots in the casing.

CUSTOMER OPTIONS

The user can make certain minor alterations to the instrument without the need for outside assistance. These are simple to carry out and require no technical skill.

RACK MOUNTING

To enable the instrument to be mounted in a standard 19in. rack two "ears" are supplied with the accessories. When these are fitted in place of the standard carrying handles, the instrument can be held in position in the rack by suitable retaining screws.

1180 with carrying handles.

Undo the two screws that secure each handle and remove both handles.

1180 with "ears" attached.

Using the same screws, fit the two ears in place of the carrying handles.

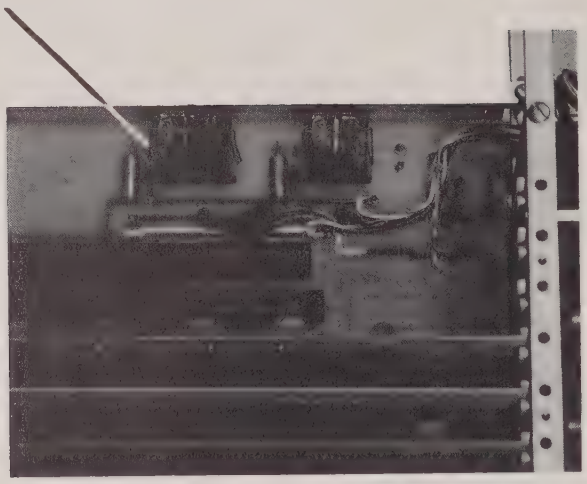
SILENT OPERATION OF THE KEYS

The audible click heard as each front panel key is touched is produced by a relay contact. If silent operation of the keys is required, the relay can be removed without affecting any other operating characteristics of the instrument.

Undo the two screws that secure each side panel.

Note: Plugs C and D have, on later models, been renamed F and G.

RELAY SK10



Slide back both side panels and remove top cover to expose the relay.

Remove the relay in SK10 together with its retaining clip.

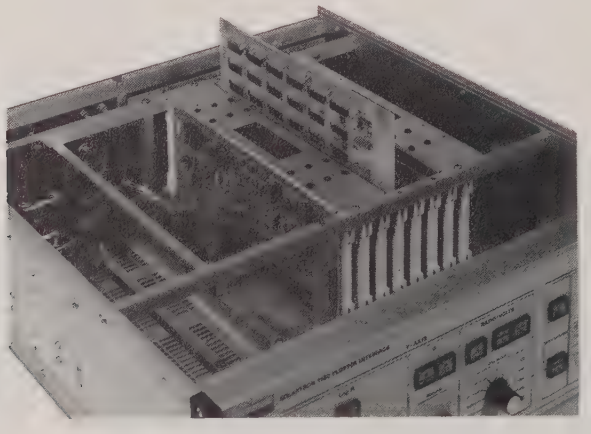
Replace top cover, slide the side panels into position and secure with the four screws.

END OF SWEEP OPTION

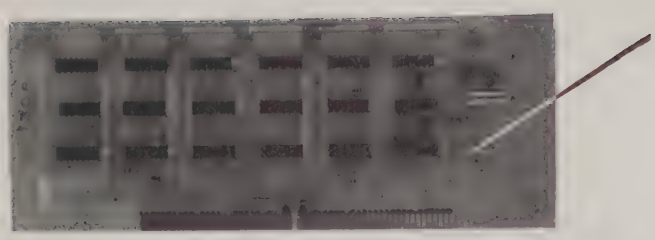
As supplied, the 1172/1180 system finishes a sweep by holding the XY Recorder pen over the last accepted point without Pen Drop, with the TRACK key flashing and the PEN DROP key extinguished. To enable the 1180 to continue plotting points as long as the 1172 is measuring the following modification is required (this is normally only required when the sweep sequence is subject to external control).

1. Remove side panels and top cover of 1180.

2. Unscrew centre board retaining plate and remove pcb 4.



3. Cut link A on the right hand side of the board.



4. Replace pcb 4 and its retaining plate.

5. Replace top cover and side panels.

XY RECORDERS OTHER THAN THE 8700

XY Recorders used with the 1180 must have the following properties:-

Capable of accepting ± 10V inputs to both axis.

A remote PEN DROP control facility.

Shift and Variable Gain facilities on each axis.

Connections to the recorder are made via the 4mm terminals on the rear panel of the 1180. If pen drop is required to be caused by contact opening the 1180 must be modified as described in PEN DROP.

Setting up an XY Recorder with the 1180 is as follows:-

Select **SET 0** on 1180.

Adjust the Shift controls on the plotter to set the pen at the appropriate zero position.

Select **SET FSD** on the 1180.

Adjust the Gain controls on the plotter to set the pen at the full scale position (top right hand corner unless a Nyquist diagram with equal axes is required).

Select **TRACK** or **PEN DROP** on the 1180 as required.

Note:

1. If the four plotter controls interact it may be necessary to repeat the setting up procedure.

2. The 8700 XY Recorder has null detectors which inform the 1180 when the pen has reached the required position, to ensure maximum plotting speed. An arbitrary delay of one second for each point is incorporated in the 1180 for XY Recorders without this facility. This time can be shortened, if required, refer "PLOTTER DELAY".

PEN DROP

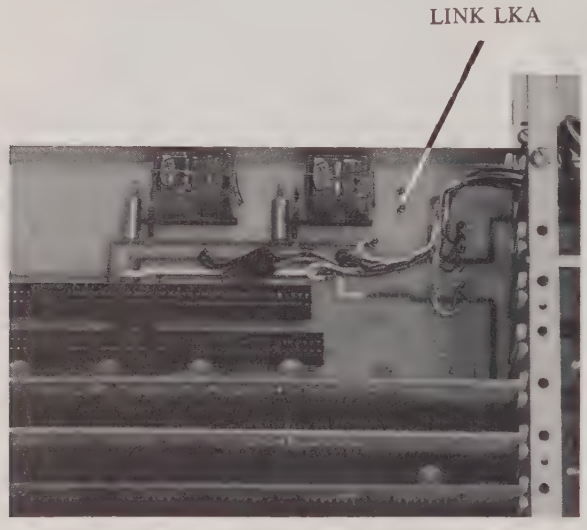
The 1180 is supplied with contact closure causing pen drop. This is made contact opening as follows:-

1. Remove side panels and top cover as before.

2. Locate pins P39, P40, P41 as shown below, next to SK11 relay.

3. Cut the link between P39 and P41 and make the link between P40 and P41.

4. Replace top cover and side panels.



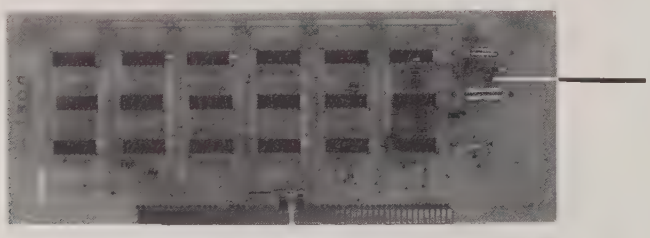
PLOTTER DELAY

An arbitary delay of one second is allowed by the 1180 for the plotting of each point (usually overridden by the 8700). If a shorter delay is required on the 1180 the following modification is required:-

1. Remove side panels and top cover of 1180.

2. Unscrew board retaining plate and remove pcb 4 as for End of Sweep Option.

3. Locate pins beside 33k ohm resistor at top right hand side of board as shown.



4. Solder a resistor across these pins as follows

Delay	Resistor
0.75 s	120k
0.5 s	33k
0.25 s	10k

5. Replace pcb 4 and its retaining plate.

6. Replace top cover and side panels.

ACCESSORIES

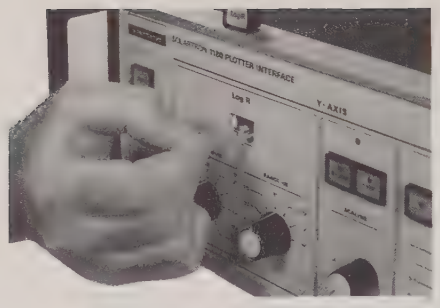
The 1180 Plotter Interface and 8700 XY Recorder are normally purchased as a combined package with the following accessories:-

	Part No.
1180 Plotter Interface	
Two rack mounting ears	4696016
One mains input lead	480140220
1172 Interface PCB and two 34 - way 1172/1180 flat interconnecting cables.	
Connector clips (2 off)	354004650
Spare mains fuses	
1A	360103080
2A	360103100
15 - way free plug	351315040
Slide lock assembly	354004460
Plug cover	354004470
Pad of mixed graph paper	800100200
3 - way plug	351303040
8700 XY Recorder	
See Bryans - Southern Instruments Manual.	
Suitable replacement fuses which may be obtained from Solartron are:-	
240V 3.15A	360106170
115V 5A	360106190
A3/A4 Paper size selector	87009030
1180 Interconnecting Cable	87000014

Changing the Touch Key Lamps

A plastic tube is supplied with the standard accessories of the 1172 to facilitate changing the bulbs in the touch keys. This can be done as follows.

Insert the blade of a small screwdriver under the touch key and prise off the moulding.

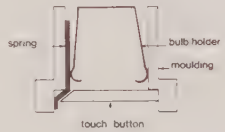


Push one end of the plastic tube firmly onto the bulb and then unscrew and remove the bulb from the touch key assembly.

Use the tube to fit the replacement bulb and replace the moulding (push on).

Note Later instruments are fitted with push - in lamp bulbs, and are supplied with a modified plastic tube. To remove these bulbs, push the end of the tube marked "Remove" firmly onto the bulb and withdraw the bulb. To replace the bulb, insert it into the end of the tube marked "Insert" as far as the shoulder of the bulb. Align the bulb with its pins in a horizontal plane and push carefully into the holder, ensuring that the pins have entered the socket before applying pressure. Withdraw the plastic tube and replace the moulding (push on).

CAUTION: When replacing the moulding make sure the metal casing is located as below.



USE WITH THE 1177

The 1180 Plotter Interface can be used with the 1177 Frequency Response Analyser without modification, but with no frequency sweep facility, i.e. each new frequency has to be manually set into the 1177.

SECTION 4 Using The Controls

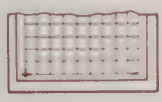
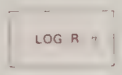
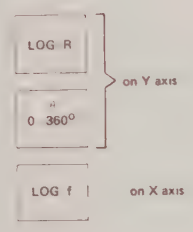
INTRODUCTION

The rules to be observed when using the controls and the order in which keys should be activated are illustrated in the following examples.

Reference should be made to "The Front Panel Controls" (Section 2) for a detailed description of the functions of individual keys and controls.

GENERAL SETTING UP PROCEDURE

Although it is possible to activate the controls of the 1180 in almost any order, the following procedure suggests a logical method of setting up the instrument, illustrated by an example, when connected in an 1172, 1180, 8700 system.

	Action	Example	Notes
1.	8700 Place appropriate graph paper on the Recorder and align with the illuminated Graticule.		Care should be taken that the plotter table is clear of books etc. before switching on. Check that the **PEN** is in the **REMOTE** position.
2.	8700 Set the switch to **SET ZERO/FSD.**		
3.	1172 Select the appropriate coordinate system.		The touch keys on 1180 will flash if they are not compatible with 1172 settings.
4.	1180 Select the parameters to be plotted.		The touch keys will stop flashing on 1180. Prior to selecting θ check that the **SCALING** potentiometer is in the CAL position.
5.	1180 Select **SET 0.**		Pen should move to the bottom left hand corner. If a Co-Quad plot is selected the pen should move to the centre of the Y-axis; if a Nyquist plot is selected the pen should move to the centre of the graph paper.

6. 8700

Depending on the type of plot, adjust the **SET ZERO** or the **SET CENTRE ZERO** controls so that the pen is over the appropriate origin.

For Bode, Nichols and Amplitude/ Frequency plots the Set Zero controls should be used on both axes. For Co-Quad plots **SET ZERO** on the X-axis and **SET CENTRE ZERO** on the Y-axis controls should be used. For Nyquist plots **SET CENTRE ZERO** controls should be used on both axis.

Final adjustment is facilitated by temporarily switching the 8700 to pen down.

7. 1180

Select **SET FSD.**

The Pen should now move to the top right hand corner of the graph paper.

8. 8700

Adjust **SET FSD** preset controls so that the pen is over the full scale position

Final adjustment is facilitated by temporarily switching the 8700 to pen down.

9. 8700

Select **TRACK.**

10. 8700

Select **REMOTE.**

11. 1180

Select **TRACK.**

The system is now calibrated for the mode chosen and the remaining controls of the 1180 may be operated without affecting the calibration.

PLOTTING GRAPHS

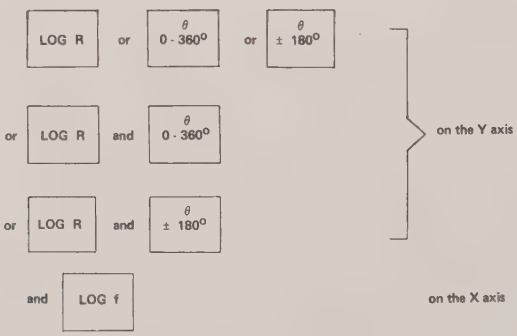
Bode Plots (Log R and/or θ against Log f).

1. 1172

Select

2. 1180

Select



3. Calibrate the zero and full scale positions as described in the "GENERAL SETTING UP PROCEDURE". The zero position is in the bottom left hand corner.

4. Set the **MINIMUM : dB** switch to a value which is equal to or below any expected during measurements and the **RANGE : dB** switch so that the maximum expected value does not exceed the sum of the minimum and range dB settings.

5. Set the **MINIMUM Hz** switch to the decade frequency equal to or below the lowest frequency to be measured and set the **RANGE : DECADES** switch to the number of decades the parameter covers.

6. Select the **TRACK** touch button. The 1180 now moves the pen to the appropriate position whenever a measurement is made with the 1172. Once the user is satisfied that the correct ranges have been chosen, the **PEN DROP** touch button is selected to enable a point (or points) to be plotted every time a measurement is made by the 1172.

NOTE:- If the above procedure is used with the Solartron graph paper supplied with the 8700 the vertical scaling for θ will be 200 divisions for 360^{o}. A 180 divisions scaling for θ (which does not affect the other parameters) can be obtained as follows.

1. Follow steps 1 to 5 for setting up a Bode Plot as detailed above.

2. 1172.

   Programme a frequency which is within the range set up in step 5 above.

3. 1172

   Check that the phase display is 000.0 DEG. (If it is not, do a measurement so that it is).

4. 1180

   Select θ ± **180** on the Y axis.

5. 1180

   Cancel **Log R** on the Y axis.

6. 1180.

   Select **TRACK.**

7. 8700

   Switch to **SET ZERO/FSD.**

8. 1180

   Adjust the θ **SCALING** potentiometer to set the pen on the 90th vertical division.

9. 8700

   Switch to **TRACK.**

10. 1180

Programme the Y axis as desired.

The system is now calibrated for 200 vertical divisions on Log R and 180 vertical divisions on θ.

Nyquist Plots (*jb* against *a*)

1. 1172

   Select

2. 1180

   Select

on the Y axis

   and

on the X axis

3. Calibrate the zero and full scale positions as described in the "GENERAL SETTING UP PROCEDURE". The zero position is in the middle of the graph paper, the X axis gain is reduced to make the plot square and the full scale point is 5cm to the left of the top right hand corner, i.e. top right hand corner of the Solartron Nyquist graph paper.

4. Set the **FULL SCALE, RATIO/VOLTS** switch to accommodate the largest expected signal. If the 1172 is working in single point (X or Y) then the switch is calibrated in volts and suitable values would be 0.01, 0.1, 1, 10, 100 and 1000. If the 1172 is working in point to point (Y/X) the switch is calibrated in ratios and should be set so that the greatest expected values do not exceed the switch setting.

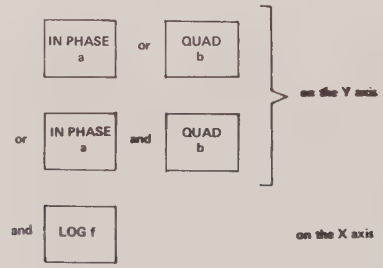
5. Select the **TRACK** touch button. The 1180 now moves the pen to the appropriate position whenever a measurement is made by the 1172. Once the user is satisfied that the correct range has been chosen, the **PEN DROP** touch button is selected to enable a point to be plotted everytime a measurement is made by the 1172.

Co - Quad Plots (*a* and/or *jb* against Log *f*)

1. 1172.

   Select

2. 1180

   Select 

3. Calibrate the zero and full scale positions as described in the "GENERAL SETTING UP PROCEDURE". The zero position is the mid point of the left hand side of the graph.

4. Set the **FULL SCALE RATIO/VOLTS** switch to accommodate the largest expected signal. If the 1172 is working in single point (X or Y) then the switch is calibrated in volts and suitable values are 0.01, 0.1, 1, 10, 100 and 1000. If the 1172 is working in point to point (Y/X) the switch is calibrated in ratios and should be set so that the greatest expected values do not exceed the switch setting.

5. Set the **MINIMUM Hz** switch to the decade frequency below or equal to the lowest frequency to be measured and set the **RANGE : DECADES** switch to the number of decades the parameter covers.

6. Select the **TRACK** touch button. The 1180 now moves the pen to the appropriate position whenever a measurement is made by the 1172. Once the user is satisfied that the correct ranges have been chosen, by the Pen Drop touch button is selected to enable a point (or points) to be plotted everytime a measurement is made by the 1172.

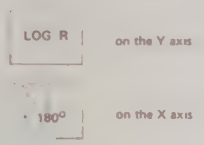
Nichols Plot (Log R against θ)

1. 1172

   Select

2. 1180

   Select



3. 1180

   Check that the θ **SCALING** potentiometer is in the **CAL** position.

4. Calibrate the zero and full scale positions as described in the "GENERAL SETTING UP PROCEDURE". The zero position is the bottom left hand corner of the graph paper.

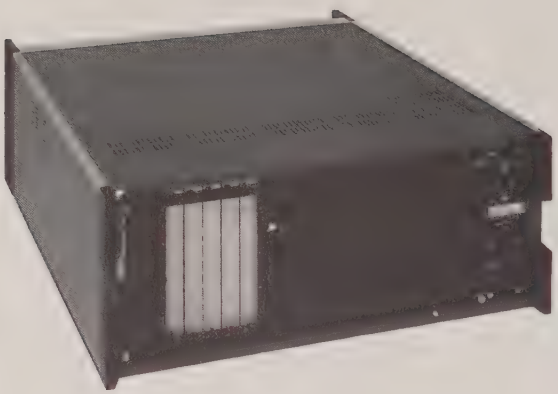
5. Set the **MINIMUM : dB** switch to −20dB and the **RANGE : dB** switch to 60dB.

6. Select the **TRACK** touch button. The 1180 now moves the pen to the appropriate position whenever a measurement is made with the 1172. Once the user is satisfied that the system is behaving correctly, the **PEN DROP** touch button is selected to enable a point to be plotted everytime a measurement is made by the 1172.

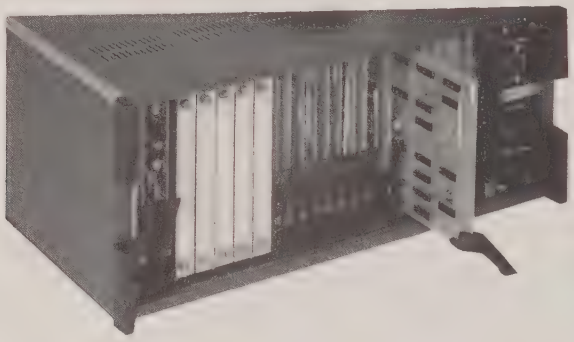
Notes:-

1. The Nichols plot is a graph of the open-loop gain against the open-loop phase from which the gain and phase margins may be estimated. Using the superimposed sets of contours, the closed-loop gain and phase responses may be read off. The calibration is meaningful only if the 1172 is operated in point-to-point mode (Y/X) so that 0dB corresponds to a loop gain of 1, and that a reading of 180^{O} (due to the phase reversal inherent in negative feedback systems) is obtained for zero loop phase shift.

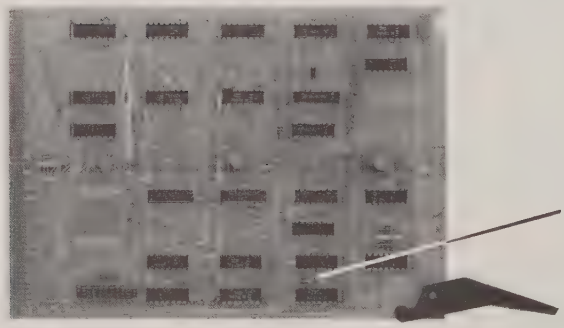
2. The 1172 is normally supplied with the convention that a lag of 45^{O} (say) is displayed as $+45^{O}$. The effect of this convention is to make the Nichols plot appear as the mirror image (about the 0^{O} line) of those appearing in most text books. The graph can be displayed with the normal convention if the 1172 is altered to read mathematical degrees (in which case a lag of 45^{O} will be displayed as $+315^{O}$). The change in the 1172 angle convention is made as follows:



1. Undo the four retaining screws and remove Rear Panel of 1172.



2. Remove Board 7.



3. Locate two solder pins in bottom right hand corner of component side of board. LKA is marked between them.

4. Solder a link between these pins with a LOW POWER soldering iron taking care not to damage the board or its components.

5. Replace board 7 and fit Rear Panel of 1172.

3. The calibration of the X-axis for Nichols plots is from -180^{o} to $+180^{o}$. However the Solartron graph paper supplied with the 8700 XY Recorder has the calibration -360^{o} to 0^{o} along its top edge to conform with the convention used in most text books. The discrepancy of 180^{o} arises because the text books neglect the inherent phase reversal in negative feedback systems whereas for practical measurements this phase reversal is included.

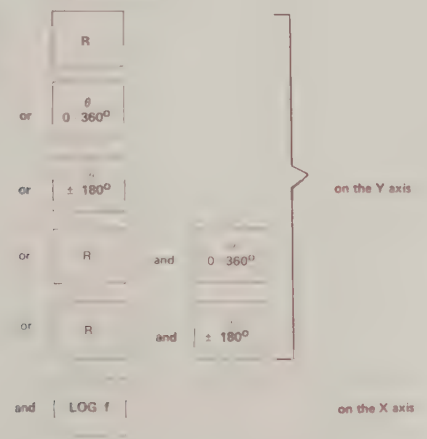
Amplitude/Frequency Plots (R and/or θ against Log f).

1. 1172

   Select | R, θ |

2. 1180

   Select



3. Calibrate the zero and full scale positions as described in "GENERAL SETTING UP PROCEDURE". The zero position is at the bottom left hand corner of the graph paper.

4. Set the **FULL SCALE : RATIO/VOLTS** switch to accommodate the largest expected signal. If the 1172 is working in single point (X or Y) then the switch is calibrated in volts and suitable values are 0.01, 0.1, 1, 10, 100 and 1000. If the 1172 is working in point to point (Y/X) the switch is calibrated in ratios and should be set so that the greatest measured value does not exceed the switch setting.

5. Set the **MINIMUM : Hz** switch to the decade frequency equal to or below the lowest frequency to be measured and set the **RANGE . DECADES** switch to the number of decades the parameter covers.

6. Select the **TRACK** touch button. The 1180 now moves the pen to the appropriate position whenever a measurement is made by the 1172. Once the user is satisfied that the correct ranges have been chosen, the Pen Drop touch button is selected to enable a point (or points) to be plotted everytime a measurement is made by the 1172.

Note: If the above procedure is used with the Solartron graph paper supplied with the 8700, the vertical scaling for θ will be 200 small divisions for 360°. A 180 division scaling for θ (which does not affect the other parameters) is described at the end of the section on Bode Plots.

GENERAL REMARKS

Frequency Sweep

1. When a frequency sweep is initiated in the 1172 using Recycle, then all the measured points are plotted until the 1172 reaches the end of its sweep when the **PEN DROP** button is automatically switched off and the **TRACK** button flashes. Further points are not plotted (although the 1172 continues to measure if left in Recycle) until another sweep is initiated.

Out of Limit Values

When the 1172 generates values which are outside the ranges programmed on the 1180 accurate plots do not result. The following possibilities can occur:

Condition	Result when using 8700
Frequency too low	Pen remains at last valid position.
Frequency too high	Pen remains at last valid position.
dBs below minimum	Pen remains at last valid position.
dBs above maximum	For small overloads pen goes about 3% over scale and for greater overloads the pen movement is inhibited.
R, a, jb above maximum	For moderate overloads pen goes about 3% over scale and for greater overloads the pen movement is inhibited.

Whenever one of the above conditions is detected by the 1180 or 8700, the null detectors cannot find a null and the plotting rate drops to that set by the internal delay in the 1180 (approx. one second).

Note:- The top frequency in a decade is 9999. Thus with the **MINIMUM : Hz** switch set to 1Hz and the **RANGE : DECADES** switch set to 1, a frequency of 9.999Hz is plotted but not a frequency of 10Hz. Other parameters (except θ) are similarly affected.

Graphs on A4 paper with the 8700 XY Recorder

The 8700 is an A3 size plotter and it is recommended that this size of paper be used to gain maximum resolution. However, for certain purposes (for example inclusion in reports) it may be desireable to plot on A4 paper. Supplied with the 8700 is the Paper Size Selector module shown below which permits A4 graphs to be plotted. The module should be connected to the 4mm terminals at the back of 1180.

When the switch is in the A3 position it has no affect on the plotting system but when it is in the A4 position the voltages are scaled down in the correct proportion to yield A4 plots.

SECTION 5 Operator Fault Diagnosis

General

The 1172, 1180, 8700 system has a number of interconnecting cables. If equipment malfunction is experienced these should be checked for proper orientation and connection. Installation of these cables is described in Section 3.

A number of possible faults and their likely causes are given in the following table.

Fault Indication	Possible Cause
1. All keys flash on 1180	a. 1172 display is not compatible with the parameters chosen on 1180 b. X-axis and Y-axis parameters on 1180 are not permissable combinations.
2. **TRACK** key flashes on 1180.	Normal operation at the end of a sweep. It is cancelled by programming one of the following:-
3. Correct lamp indications but no apparent measure-- ment.	a. Incorrect values of fMIN, fMAX and Δf programmed on 1172. b. Incorrect Measure Delay or Integration Time on 1172. c. Wrong frequency selected on 1172.
4. Touch key does not light.	Bulb or Key Holder. 1. With fine screwdriver carefully lever off black moulding and check lamp for security and continuity. 2. Touch spring in white moulding, with finger, to prove circuit (lamp lights). 3. Check both spring contacts for proper alignment. 4. Replace black moulding ensuring correct orientation.

SECTION 6 Technical Specification

1180 PLOTTER INTERFACE

SCALING

Log R	Minimum dB:- -80dB to + 120dB in 20dB steps. dB Range:- 20dB to 140dB.
Ratio	10^{-4} to 10^{6} (Full Scale).
Volts	10.00mV to 1000V. (Full scale)
θ	0 to 360^{o} or $\pm$ 180^{o}

FREQUENCY

Minimum Hz	0.1mHz to 1kHz in decade increments.
Range (decades)	1 to 8.

PLOTTING MODES

A total of 13 modes are available:

Y Axis	X Axis	Title
jb	a	Nyquist
a	Log f	Co-quad
jb	Log f	Co-quad
a, jb	Log f	Co-quad
Log R	Log f	Bode (Part)
Log R, θ (0 – 360^{o})	Log f	Bode
Log R, θ ($\pm$ 180^{o})	Log f	Bode
θ (0 – 360^{o})	Log f	Bode (Part)
θ ($\pm$ 180^{o})	Log f	Bode (Part)
R	Log f	
R, θ (0 – 360^{o})	Log f	
R, (θ $\pm$ 180^{o})	Log f	
Log R	θ $\pm$ 180^{o}	Nicholls

8700 XY RECORDER

CALIBRATION

Set Zero	Preset potentiometers for X and Y axes.
Set Centre Zero	Preset potentiometers for X and Y axes.
Set Full Scale	Preset potentiometers for X and Y axes.
Input System	Single ended with respect to ground on both axes.
Input Resistance	2MΩ
Maximum Writing Speed	Y Axis 125cm/sec. X Axis 88cm/sec.
Slewing Speed	152cm/sec.
Acceleration	Y Axis 3400cm/sec^2 X Axis 2250cm/sec^2
Peak Acceleration	Y Axis 5100cm/sec^2 X Axis 3375cm/sec^2

Linearity	Better than 0.1%	
Repeatability	Better than 0.1%	
Drift	0.2% of fsd over 8hrs.	
Plotting Area	A3 380 × 280mm (suitable for A3 paper).	
Paper Hold Down	Vacuum	
Paper Registration	Illuminated graticules	
Pen	Capillary with integral reservoir or fibre tip with integral reservoir.	
Pen Control	May be lowered by control on panel or by remote control from the 1180.	
Connector	ITT Cannon 'D' Series 15 way socket. Mating plug and multiway cable for use with 1180 supplied with unit.	
Dimensions	Height	140mm
	Width	520mm
	Depth	480mm
	Weight	20kg

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